



Aalborg Universitet

AALBORG UNIVERSITY  
DENMARK

## First observation of the atomistic source of mechanical toughness in glass bio-cements during setting

*An invited talk*

Greaves, N.; Chass, G.; Yue, Yuanzheng

*Publication date:*  
2016

[Link to publication from Aalborg University](#)

*Citation for published version (APA):*

Greaves, N., Chass, G., & Yue, Y. (2016). *First observation of the atomistic source of mechanical toughness in glass bio-cements during setting: An invited talk*. Abstract from 2016 Glass & Optical Materials Division Meeting, Madison, United States.

### General rights

Copyright and moral rights for the publications made accessible in the public portal are retained by the authors and/or other copyright owners and it is a condition of accessing publications that users recognise and abide by the legal requirements associated with these rights.

- Users may download and print one copy of any publication from the public portal for the purpose of private study or research.
- You may not further distribute the material or use it for any profit-making activity or commercial gain
- You may freely distribute the URL identifying the publication in the public portal -

### Take down policy

If you believe that this document breaches copyright please contact us at [vbn@aub.aau.dk](mailto:vbn@aub.aau.dk) providing details, and we will remove access to the work immediately and investigate your claim.

# **First observation of the atomistic source of mechanical toughness in glass bio-cements during setting**

Bio-cements, notably glass-ionomer cements, have been in widespread use for over 40 years in dentistry and medicine. Progress in improving their mechanical properties, however, lags behind the toughness needed for permanent implants. A significant impediment to improvement has been the need to use conventional mechanical failure methods, which are necessarily retrospective. Through the novel use of neutron Compton scattering, and also terahertz spectroscopy and DSC (Nature Communications 6 8631pp 1-10 (2015)), it has been possible to relate fracture toughness during setting to atomic cohesion, from which fluctuations in interfacial configurations during chelation between the highly phase separated glass and the PAA polymer are observed. In this paper we show how, compared to convention, the setting of glass-ionomer cements is not monotonic. Rather, as they set, abrupt features are found in the development of mechanical toughness, which have not been previously detected. These provide clues by which mechanical performance of bio-cements might be improved.